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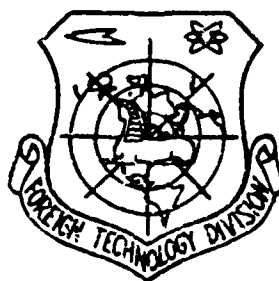
FOREIGN TECHNOLOGY DIVISION



THE DEVELOPMENT AND APPLICATION OF COMPOSITE MATERIALS BY NANJING
AVIATION INSTITUTE

by

Li Shunlin



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TITLE: THE DEVELOPMENT AND APPLICATION OF COMPOSITE
MATERIALS BY NANJING AVIATION INSTITUTE

AUTHOR: Li Shunlin

The Nanjing Aviation Institute already has more than a 20 year history in the area of research on the development and applications of composite materials. There are already a good number of research products which have been applied in aircraft and other products. This is particularly the case in the area of super-light aircraft. In 1985, this institute organized one specialized contingent combining research on materials, theoretical properties and industrial techniques, mechanics, and structural design, strengthening even more its research into the development and applications of composite materials.

In the area of the development of new materials, use has been made of various types of different structures in organic silicon compounds to effectively improve the shock resistance properties of polyethylene, forming mutually interlaced polyethylene/organic silicon systems to create adhesives. Test production has been made of double ended polysulphone resins which possess excellent anti-corrosion and mechanical properties and are capable of carrying vinyl or ethenyl radicals. In order to obtain extremely great improvements in their properties, from high polymer materials and nonorganic ceramic materials, combinations were made producing infrared hidden body materials which were changed in the infrared wave band. As a result of this, they obtained interference effects on infrared radars and guidance head detection. As far as research on PTC barium and titanium ceramic materials is concerned, at the present time, they are already used in the manufacture of components for color demagnetizers and refrigerator starters. Besides this, the Institute has also test manufactured a new type of processing or treatment agent used to glue

together a type of copolymerchloroethelyne/glass fiber reinforced plastic which is widely used for connections between PVC/glass fiber reinforced plastic composite tubing used in the petroleum, chemical, and military industries. It is inexpensive, and its adhesive strength is twice as great as the original.

In the area of the development and manufacture of products, in cooperation with the Huashi Glass Chemical Plant of Jiangyin City, the Institute test manufactured glass fiber reinforced plastic washing drums for use in paper manufacturing machinery. This solved the problems of the past wood pulp washing drums corroding easily, short life (generally two years), large amounts of maintenance, low production efficiency, and large energy consumption. The use of the



Fig.1 Glass Fiber Reinforced Washing Drum

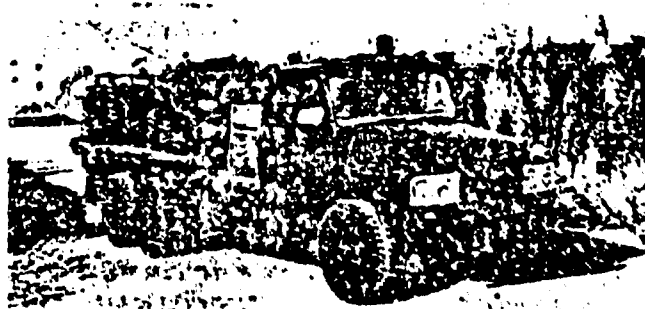


Fig.2 Fire Truck Using Glass Fiber Reinforced Plastic Water Tank

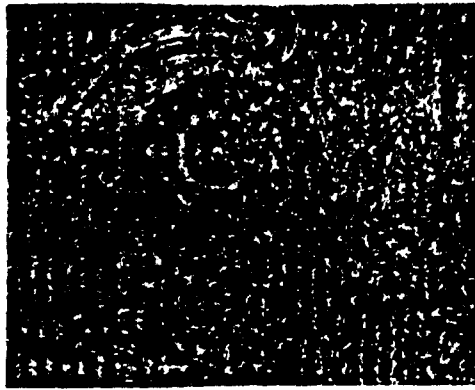


Fig.3 Glass Fiber Reinforced Plastic Blower

new washing drums gives a life of over 10 years. At the present time, this product has already obtained a Jiangsu Province Evaluation Certificate (See Fig.1).

The Institute cooperated with the Suzhou City Wujiang General Glass Fiber Reinforced Plastics Plant to test produce, for the Shanghai General Fire Fighting Equipment Plant, the CG40/40 fire truck glass fiber reinforced plastic water tank, which is, at the present time, already installed on vehicles and in test use (See Fig.2). The water tanks in the past, which were made of steel, were easily corroded by water or fire extinguishing liquids. Their life was only approximately 3 years. However, the new tanks are capable of going over 10 years. Moreover, they are approximately 1/3 the weight. This raises yet another step the overall capabilities of fire fighting vehicles.

The centrifugal type glass fiber reinforced blower that is being test manufactured at present is not only capable of overcoming the ease of corrosion with the metal blowers; it also overcomes the lack of strength in plastic blowers, as well as the problem with their easily blowing up. In terms of characteristics, it goes without saying that the amount of flow and pressure are both 30% or more higher than domestically produced blowers of the same type.

In the arena of basic and applied research, our institute has--right from the beginning--dealt with research on the strength theory of composite material layer breaks. In conjunction with this, as far as the analysis of the forms of fractures in combined materials, discovering the strengths between layers, and the

structural relationships between layers are concerned, we have brought forward new concepts associated with orthogonal shear strengths between layers and oblique shear strengths between layers. In conjunction with this, we have measured the patterns in the changes of strengths and brought forward causes which exist for these types of laws.